

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Withdrawn) A unit-layer post-treatment catalyst chemical-vapor-deposition apparatus for forming a thin film on a substrate by using the catalyst action of an exothermic catalyst body resistance-heated in a reactive vessel capable of performing vacuum pumping, comprising: a gas supply system capable of introducing flow rates of thin-film-component-contained gas and hydrogen gas into the reactive vessel like a pulse; and an exhaust system capable of performing vacuum pumping and pressure control, wherein the above thin-film-component-contained gas and hydrogen gas introduced like a pulse contact with the exothermic catalyst body and decompose and form a thin film for each unit layer on the substrate, and form a laminated thin film by surface-treating the thin film for each unit layer.

2. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that the surface treatment is one or both of the surface treatment by thin-film-component-contained gas excluding silicon and containing active species and the surface treatment by hydrogen gas containing active species.

3. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that the catalyst performance is regenerated by applying hydrogen gas to the exothermic catalyst body.

4. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that the surface treatment is one or both of the extracting treatment of surplus thin-film component and direct adding treatment of a thin-film component.

5. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that one of nitrogen gas and rare gas is used instead of the hydrogen gas.

6. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that the thin-film-component-contained gas is made of at least one of hydride of silicon and halide of silicon, and at least one of nitrogen and hydride of nitrogen.

7. (Withdrawn) The unit-layer post-treatment catalyst chemical-vapor-deposition apparatus according to claim 1, characterized in that the thin-film-component-contained gas containing active species in the surface treatment is one or both of nitrogen and hydride of nitrogen.

8. (Currently Amended) A method for forming a laminated thin film on a substrate composed of plural unit layers, each unit layer comprising a surface-treated thin film on a substrate by using the catalyst action of an exothermic catalyst body

resistance heated in a reactive vessel capable of performing vacuum pumping, said method comprising:

a step of providing a gas supply system comprising a thin-film-component gas line, a hydrogen gas line, a first mass-flow controller positioned in the thin-film-component gas line, a first valve, a second valve, a first line coupling the first mass-flow controller to a vent, and a second line coupling the first mass-flow controller to the reactive vessel, wherein the first valve is positioned in the first line between the first mass-flow controller and the vent and the second valve is positioned in the second line between the first mass-flow controller and the reactive vessel;

a step of opening the first valve and closing the second valve to supply a predetermined flow rate of the thin-film-component gas to the vent;

a step of simultaneously closing the first valve and opening the second valve to introduce rectangular pulsed flows of the thin-film-component gas to the reactive vessel;

an activating step of generating active species by introducing-pulsed-flows-of thin-film-component-gas-and-hydrogen-gas; bringing the thin-film-component gas and the hydrogen gas gases into contact with the exothermic catalyst body, [[and]] thereby generating active species of the gases;

a film forming step of forming a thin film for each unit layer on a substrate;

a surface treating step of surface-treating the thin film for [[every]] each unit layer by the hydrogen gas active species;

another surface treating step of surface-treating the thin film for [[every]] each unit layer by the thin-film-component gas active species; and

repeating one of the one surface treating step and the other surface treating step
for each unit layer during one cycle,

wherein the surface treating step and the other surface treating step can be
carried out in any order, and

wherein whereby a laminated thin film is formed by the unit layers using a series
of steps for respectively performing surface treatment after forming a film as one cycle,
and repeating a plurality of cycles.

9. (Currently Amended) The method according to claim 8, further
comprising a step of repeating one of the one surface treating step and other surface
treating step a plurality of times during one cycle for each unit layer.

10. (Previously Presented) The method according to claim 8, wherein said
film forming step and one or both of said one surface treating step and said other
surface treating step are performed continuously.

11. (Currently Amended) The method according to claim 8, further
comprising the step of vacuum-pumping remaining gas after one of the film forming
step, the one surface treating step and the other surface treating step.

12. (Previously Presented) The method according to claim 8, wherein the
one surface treating step is extracting a surplus thin-film component and the other
surface treating step is adding a thin-film component.

13. (Currently Amended) The method according to claim 8, wherein the final step of one-cycle for a specific unit layer is performing surface treatment by thin-film-component gas active species excluding silicon.

14. (Previously Presented) The method according to claim 8, wherein one of nitrogen gas and an inert gas is used in addition to hydrogen gas.

15. (Previously Presented) The method according to claim 8, wherein the thin-film-component gas is made of at least one of a hydride of silicon and a halide of silicon, and at least one of nitrogen and a hydride of nitrogen.

16. (Previously Presented) The method according to claim 8, wherein the thin-film-component gas active species in the surface treatment is one or both of nitrogen and a hydride of nitrogen.

17. (Previously Presented) The method according to claim 8, wherein the thin-film-component gas is made of a monosilane gas and ammonia gas, the film forming step forms a silicon nitride film for each unit layer on a substrate, and the other surface treating step is surface-treating a silicon nitride film for each unit layer by ammonia gas active species.

18. (Currently Amended) The method according to any one of claims 15

to 17, wherein ~~[[the]]~~ a final step of one cycle is forming a specific unit layer comprises
performing surface treatment by ammonia gas active species.

19. (New) The method according to claim 8, wherein the gas supply system further comprises a second mass-flow controller positioned in the hydrogen gas line, a third valve, a fourth valve, a third line coupling the second mass-flow controller to a vent, and a fourth line coupling the second mass-flow controller to the reactive vessel, wherein the third valve is positioned in the third line between the second mass-flow controller and the vent and the fourth valve is positioned in the fourth line between the second mass-flow controller and the reactive vessel, said method further comprising:

a step of opening the third valve and closing the fourth valve to supply a predetermined flow rate of the hydrogen gas to the vent; and

a step of simultaneously closing the third valve and opening the fourth valve to introduce rectangular pulsed flows of the hydrogen gas to the reactive vessel.